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Alona meridionalis sp.n. — a new species of Chydoridae (Branchiopoda: Cladocera: Anomopoda) from South Africa, with transverse lateral head pores

Alona meridionalis sp.n. — новый вид семейства Chydoridae (Branchiopoda: Cladocera: Anomopoda) из Южной Африки с продольными боковыми головными порами

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KEY WORDS: *Alona meridionalis* sp.n., Cladocera, description, systematics, morphology, transverse lateral head pores.

КЛЮЧЕВЫЕ СЛОВА: *Alona meridionalis sp. n.*, ветвистоусые раки, описание, систематика, морфология, щелевидные боковые головные поры.

ABSTRACT. A new species of cladoceran from the family Chydoridae (Branchiopoda, Anomopoda) from the Drakensberg Mountains of South Africa is described. *Alona meridionalis* sp.n. differs from the other species of *Alona* by transverse lateral head pores without pocket-like cavities under them. Morphology and position of the new species within the genus are discussed. It seems to be closely related to the pair of Iberian species inhabiting strongly mineralized waters, *Alona salina* Alonso, 1996 and *Alona orellanai* Alonso, 1996.

РЕЗЮМЕ. Описан новый вид ветвистоусых раков семейства Chydoridae (Branchiopoda, Anomopoda) из Южной Африки. *A. meridionalis* sp.n. отличается от других видов рода *Alona* щелевидными головными порами без полостей под ними. Обсуждается морфология и систематическое положение нового вида. Ближайшими родственниками *A. meridionalis* являются два вида, обитающие на Иберийском полуострове в водоемах с сильной минерализацией, *Alona salina* Alonso, 1996 и *A. orellanai* Alonso, 1996.

Introduction

At present, Cladocera of South Africa, especially members of the family Chydoridae, are studied inadequately [Korovchinsky, 1992]. The only significant study of the region fauna was conducted by Sars [1895, 1916], who described several endemic species from the Cape region.

Among them, he had described four new species of *Alona* Baird, 1840. Examination of G.O. Sars' original material in the Zoological Museum of Oslo University revealed that one of them, *A. striolata* Sars, 1916 is a good species, which differs from the other species of *Alona* by the peculiar sculpturing of the valves. Another, *A. harpularia* Sars, 1916 seems to be a synonym of *A. bukobensis* Weltner, 1897 [personal observation]. No original material remains of two other species, *A. crassicauda* Sars, 1916 and *A. arcuata* Sars, 1916. Neither of these species was ever reported again in Africa. Other species of the genus, reported in Sars' work include *A. affinis* (Leydig, 1860), *A. intermedia* Sars, 1962, *A. bukobensis* and *A. cambouei* Guerne & Richard, 1983 (*A. pulchella* King, 1853 in his work) [for information about the last species see Sinev, 2001a].

Most other endemic Chydoridae of the region (*Tretocephala coletti* (Sars, 1895), *Leudigia propinqua* Sars, 1903, *L. microps* Sars, 1916) also belong to the subfamily Aloninae. No endemics of the subfamily Chydorinae were recorded in South Africa until recently. An endemic species of the genus *Rak* Smirnov, &&& was found in the region by Prof. D.G. Frey [unpublished; R.J. Shiel, pers. comm.], and Smirnov [2007] found an endemic species, *Dumontiellus africanus* Smirnov, 2007 in the Drakensberg Mountains. *Dumontiellus* Smirnov, 2007 is the only endemic genus of Chydoridae recorded for South Africa. Sars' studies deal mostly with the low-land regions, and the Chy-

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doridae fauna of the Drakensberg Mountains is studied insufficiently. The mountains, especially the East Escarpment portion, are inhabited by several endemic species of Anostraca [Hamer & Brendonck, 1997], so other endemic Branchiopoda species could be expected here as well. A new species of the genus *Alona* from this region is described.

Material and Methods

The study was based on the extensive collection of Cladocera from South Africa (the Republic of South Africa and Lesotho), gathered by Dr. Prof. Koen Martens (University of Amsterdam) during 1989–1996, and now deposited as subsamples in the collection of Prof. N.N. Smirnov, in the Zoological Museum of Moscow State University.

The animals and ephippia were selected from samples under a binocular stereoscopic microscope, placed on slides (in a drop of a glycerol-formaldehyde mixture) and studied entire under an optical microscopel. Several specimens from each population were dissected for analysis of appendages. Eight specimens were lyophilised, mounted on an aluminium stub, coated with gold, and examined under a scanning electron microscope (Hitachi S 405-A). Measurements were made using an eyepiece-micrometer; all drawings were made with camera lucida.

ABBREVIATIONS. *In the list of material*: ZMMU — Zoological Museum of Moscow State University, NNS — collection of Prof. N.N. Smirnov, now deposited at Zoological Museum of Moscow State University. *In illustrations and text*: I–V — thoracic limbs I–V; as — accessory seta of limb I; e1–3 — endites 1–3 of limb I; ep — epipodites, ex — exopodites of limbs; IDL — inner distal lobe of limb I; IP — interpore distance (distance between anterior and posterior major head pores); ODL — outer distal lobe of limb I; PP — postpore distance (distance between posterior head pore and posterior corner of head shield); s — sensillum.

Results

Alona meridionalis **sp.n.**

Type locality: The Republic of South Africa, Eastern Cape, McClear, rockpool at Prentjiesberg, 31° 8’48’’ S, 28° 8’18’’E.

MATERIAL. Holotype: parthenogenetic female, ZMMU, Ml-53.

Paratypes: 15 parthenogenetic females, 2 ephippia, ZMMU Ml-54.

Other material: 13 parthenogenetic females from type locality (dissected and used for SEM); 13 parthenogenetic females, 6 ephippial females, 1 juvenile male of instar 1 from the Republic of South Africa, Eastern Cape, McClear, other rockpool at Prentjiesberg, 31° 8′48″ S, 28° 8′18″ E, NNS-2002-134.

ETYMOLOGY. The species name means “Southern” in Latin, as it was found in the Southernmost part of Africa.

DIAGNOSIS. *Female. Alona* species of moderate size. Body egg-shaped, of moderate height, length about 1.6 times maximum height, maximum height at the second quarter of the body. Ventral margin with 55–65 setae. Posteroventral corner without denticles. Carapace without prominent sculpturing. Head shield with broadly rounded posterior margin, rostrum short and rounded. Three major head pores with a narrow connection between them. PP about 0.7–1 IP. Lateral head pores in shape of short transverse slots, located at 1.5 IP distance from midline, at level of central major pore. Labral keel wedge-shaped, with blunt apex, without any clusters of setules on posterior margin.

Postabdomen of moderate length and width, narrowing distally, length about 2.2–2.4 height. Distal margin convex, distal angle rounded. Dorsal margin with distal part about 1.6 times longer than preanal one, with postanal portion slightly shorter than anal one. Preanal angle weakly defined, postanal angle not defined. Postanal margin with 7–9 groups of 2–4 short denticles. Anal margin with 3–5 groups of marginal setules. Postanal portion with 7–8 lateral fascicles of setules, posteriormost setae of each fascicle longest, two times longer than marginal denticles. Postabdominal claw equal in length to the preanal portion of postabdomen. Basal spine short, curved, about 0.2 length of the claw length.

Antennule broad, with nine terminal aesthetascs not exceeding half length of antennule. Antennal formula, setae 0-0-3/1-1-3, spines 1-0-1/0-0-1. Seta arising from basal segment of endopodite longer than endopodite. Spine on basal segment of exopodite shorter than middle segment. Spines on apical segments shorter than apical segments.

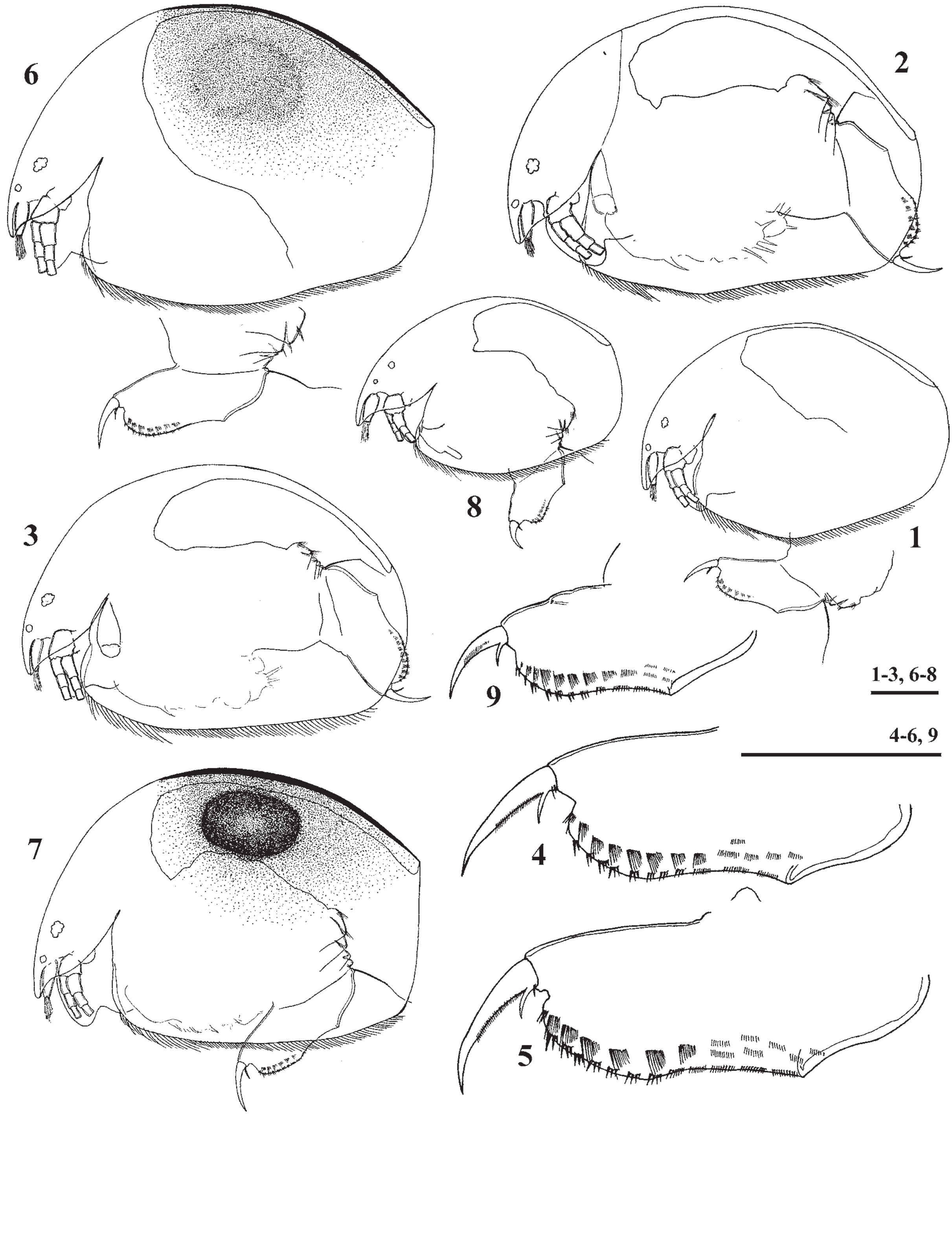
Trunk limb I with short accessory seta, IDL of trunk limb I with three setae, 1st IDL seta short and slender, two others long, armed with short setules distally. Exopodite of trunk limb III with seven setae, seta 3 being longest. Exopodite IV with six setae. Exopodite V with four setae. Epipodites IV and V with projections not longer than exopodite itself. Trunk limb VI absent.

Male unknown.

DIFFERENTIAL DIAGNOSIS. The main distinctive character of *A. meridionalis* is the morphology of lateral head pores. Transverse slot-shaped lateral pores are present in the species of the *costata*-group of *Alona*, but A. *meridionalis* lack the distinctive cavities in shape of pockets under the pore, characteristic to the *costata*-group. Other distinctive characters of *A. meridionalis* include the egg-shaped body with maximum height in the second quarter, comparatively short postabdomen with rounded dorsodistal angle and with clusters of weakly-developed marginal denticles, thick antennule with short aesthetascs, long seta of basal segment of endopod of antenna, and filter plate V consisting of single seta.

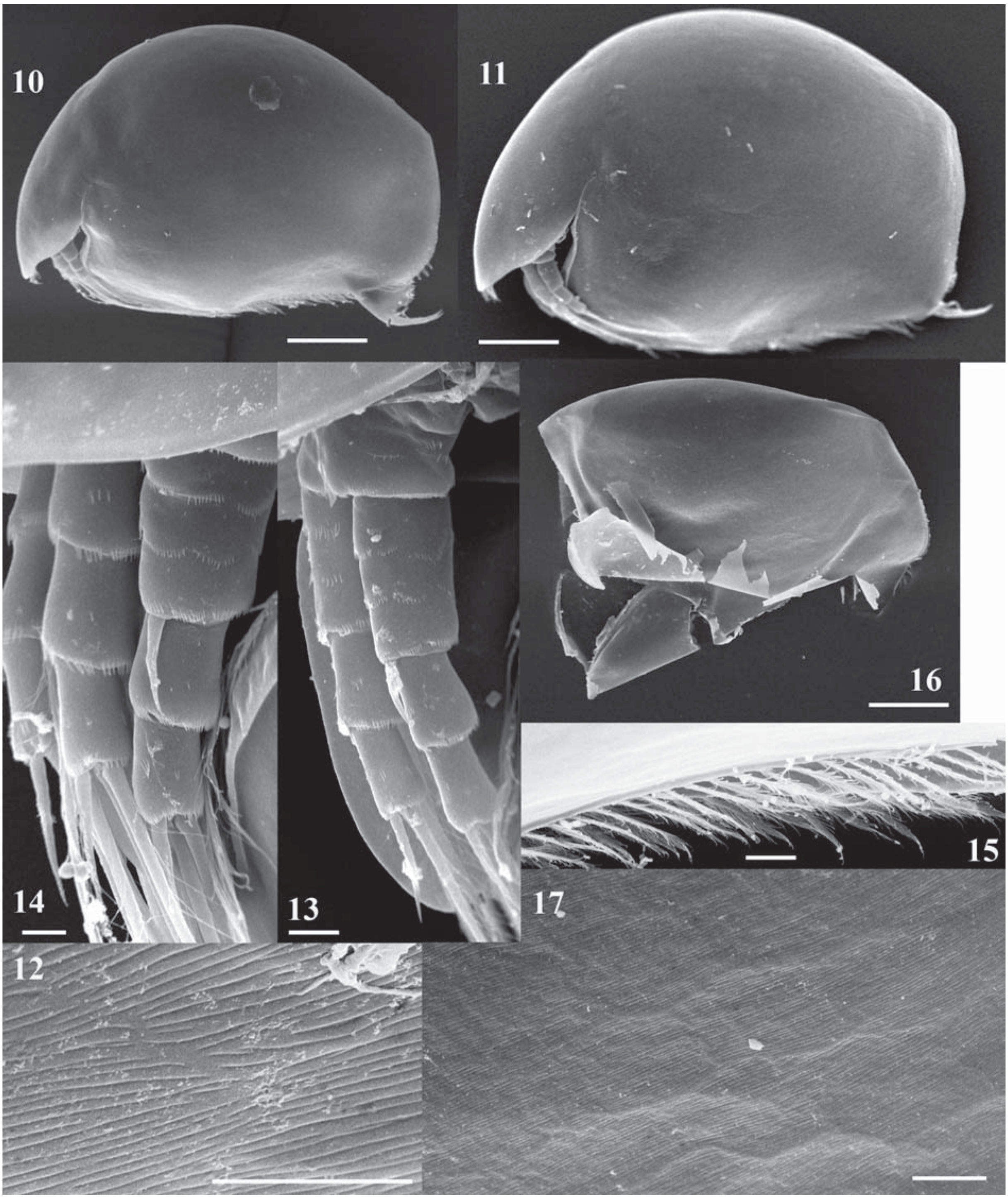
DESCRIPTION. Parthenogenetic female. In lateral view, body irregular ovoid, lower in juvenile females (Fig. 1), regular oval, of moderate height in adults (Figs 2–3, 10–11), moderately compressed laterally. Maximum height in the second quarter of body. In adults length about 1.6 times maximum height. Dorsal margin strongly arched. Posterodorsal and posteroventral angles broadly rounded. Posterior margin convex. Posteriodorsal angle (Fig. 23) with about 50 short setules, these setules not organized into groups. A row of about 70 short setules along posterior margin on inner side of carapace. Ventral margin weakly convex to straight, with about 55–65 setae, first 15–20 setae long, about 10 following setae very short, about 30 posterior setae of moderate length, evenly decreasing in size posteriorly (Fig. 15). Anteroventral angle rounded. Carapace without prominent sculpture, cowered by fine dense longitudinal striae (Fig. 12).

Head of moderate size, triangular-round in lateral view. In lateral view rostrum protruding downwards. Ocellus small, eye two times larger than ocellus. Distance from tip of rostrum to ocellus subequal to that between ocellus and eye.



Figs 1–9. *Alona meridionalis* sp.n. from the Republic of South Africa, Eastern Cape, McClear, rockpool at Prentjiesberg: 1 — juvenile female of instar II; 2–5 — parthenogenetic female: 2–3 — lateral view, 4–5 — postabdomen; 6–7 — ephippial female; 8–9 — juvenile male of instar I: 8 — lateral view, 9 — postabdomen. Scale bars denote 0.1 mm.

Рис. 1–9. *Alona meridionalis* sp.n. из Южноафриканской Республики, Eastern Cape, McClear, rockpool at Prentjiesberg: 1 — ювенильная самка второго возраста; 2–5 — партеногенетическая самка: 2–3 — внешний вид, 4–5 — постабдомен; 6–7 — эфиппиальная самка; 8–9 — ювенильный самец первого возраста: 8 — внешний вид, 9 — постабдомен. Масштаб 0,1 мм.



Figs 10–17. *Alona meridionalis* sp.n. from the Republic of South Africa, Eastern Cape, McClear, rockpool at Prentjiesberg: 10–15 — parthenogenetic female: 10–11 — lateral view, 12 — sculpture of valves, 13 — antenna and labrum, 14 — antenna, 15 — setae of ventral margin of valves; 16–17 — ephippium: 16 — lateral view, 17 — sculpture of posteroventral part. Scale bars denote 0.1 mm for 10–11, 16, 0.01 mm for 12–14, 17.

Рис. 10–17. *Alona meridionalis* sp.n. из Южноафриканской Республики, Eastern Cape, McClear, rockpool at Prentjiesberg: 10–15 — партеногенетическая самка: 10–11 — внешний вид, 12 — скульптура створок, 13 — антенна и лябрум, 14 — антенна, 15 — щетинки нижнего края створок; 16–17 — эфиппий: 16 — внешний вид, 17 — скульптура задне-нижней части. Масштаб 0,1 мм для 10–11, 16, 0,01 мм для 12–14, 17.

Head shield (Fig. 18) with maximum width behind mandibular articulation, covered by striae similar to these on valves. Rostrum short and rounded. Posterior margin broadly rounded. Three major head pores of same size, with a narrow connections between them (Figs 19–20, 31). Interporal connections with distinctive linear depression at midline (Fig. 32), not observed in other species of the genus studied under SEM. PP about 0.7–1 IP in adult females. Lateral head pores in shape of short transverse slots (Fig. 33), somewhat similar to those of *costata*-group, but without any pockets under them, located in small depressions about 1.5 IP distance from midline, at level of central head pore. In studied juvenile females of instar II, PP less than 0.4 IP, major head pores significantly larger than in adults (Figs 27, 29), lateral pores 1.5 times shorter than in adults (Fig. 30).

Labrum of moderate size (Figs 20–21). Distal labral plate without setulation. Labral keel of moderate width, wedge-shaped, with a blunt apex and lateral indentations, similar to these present in genus *Karualona* [Dumont & Silva-Briano, 2000]. Anterior margin of keel weakly convex, posterior margin almost straight, without clusters of setae.

Thorax two times longer than a*bdomen*. Dorsal surface of abdominal segments not saddle-shaped. No abdominal projections.

Postabdomen (Figs 4–5) of moderate length and width, narrowing distally, length about 2.2–2.4 heights. Ventral margin straight. Basis of claws bordered from distal margin by clear incision. Distal margin convex, distal angle rounded. Dorsal margin with weakly convex postanal portion and weakly concave in anal one, with distal part about 1.6 times longer than preanal one, with postanal portion slightly shorter than anal portion. Preanal angle weakly defined, postanal angle not defined. Postanal margin with 7–9 groups of 2–4 short denticles. Length of longest denticles about 0.5 width of base of postabdominal claw. Anal margin with 3–5 groups of marginal setules. Postanal portion with 7–8 lateral fascicles of setules, posteriormost setae of each fascicle longest, two times longer than marginal denticles. Anal portion with numerous smaller fascicles of setules, spaced irregularly, in several rows. Postabdominal claw of moderate length, equal in length to the preanal portion of postabdomen. Basal spine short, curved, about 0.2 length of the claw.

Antennule (Fig. 24) of moderate size, almost reaching the tip of rostrum, with 3–4 transverse rows of short setules at anterior face. Antennular seta of about half length of antennule, arising at 2/3 distance from the base. Nine terminal aesthetascs, two longest about ½ length of antennule and thin, little shorter than antennule itself, other much shorter, about 1/3–1/4 length of antennule.

Antenna relatively short (Figs 13–14, 25). Antennal formula, setae 0-0-3/1-1-3, spines 1-0-1/0-0-1. Basal segment robust, with very short seta between branches, branches slender, all segments cylindrical, basal segments of both branches two times longer than middle and apical segments. Seta arising from basal segment of endopod well-developed, of same thickness as other antennal setae, and longer than endopod. Seta arising from middle segment of endopod of similar size with apical setae. Spine on basal segment of exopod shorter than middle segment. Spines on apical segments little shorter than apical segments.

Mandible of morphology usual for genus. *Maxillule* (Fig. 26) with two setae pointed to its base.

Trunk limbs: five pairs.

Trunk limb I of moderate size (Fig. 34). Epipodite oval, without any finger-like projection. Accessory seta short, three times shortly than ODL seta. ODL with one seta. IDL (Fig. 35) with three setae. 1st IDL well-developed, slender and sharp, three times shortly than ODL seta, both 2nd and 3rd IDL setae 2-segmented, with short setules in distal part. 3rd seta thick and curved, slightly shorter than ODL seta, but two times thicker, 2nd seta almost straight, slightly shorter than 3rd seta, of same thickness as ODL seta.

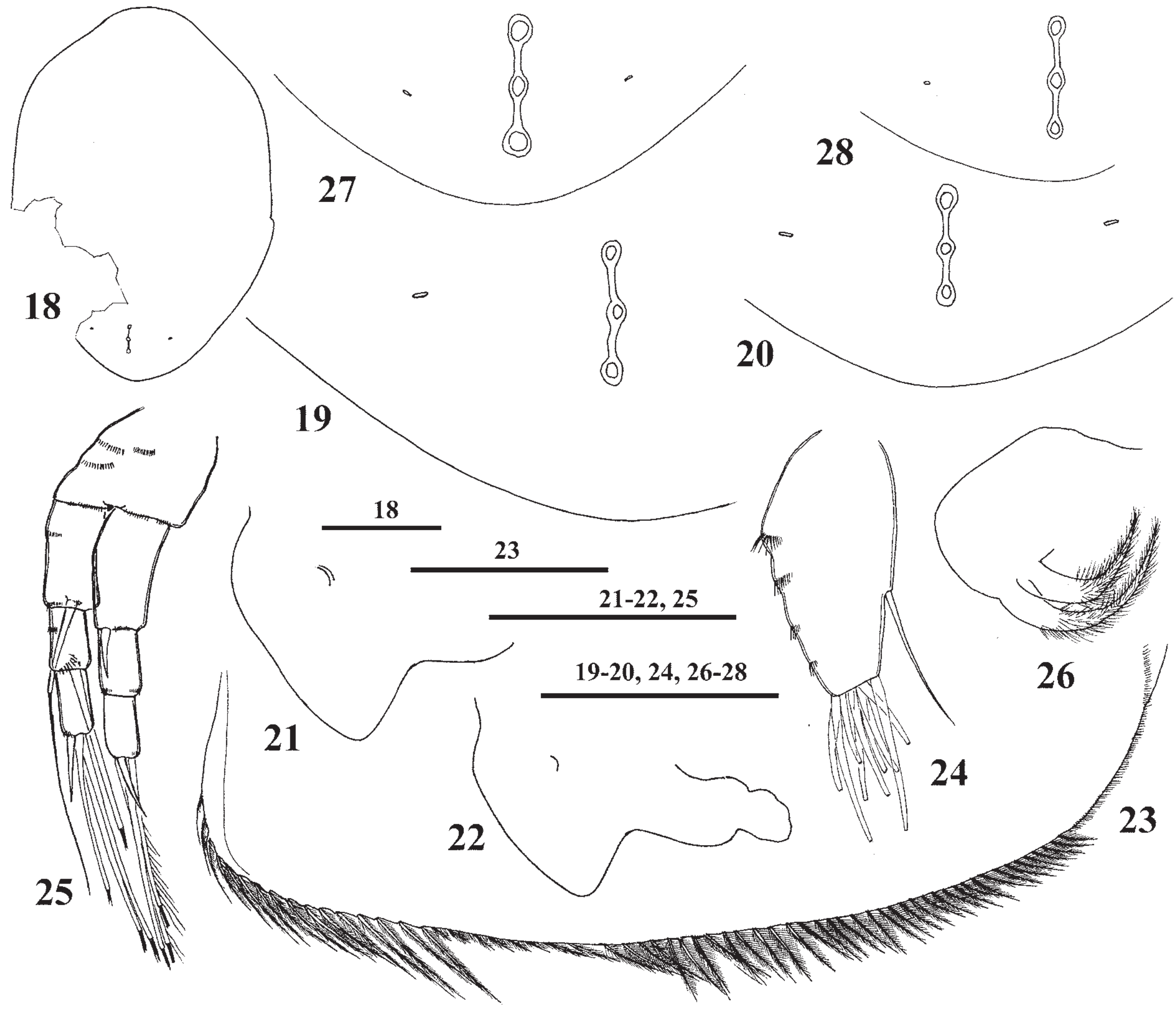
Endite 3 (Fig. 36) with four setae subequal in length, one of them much more slender than others. Endite 2 with three setae of unequal length, longest of them longer than ODL seta, shortest of same length as endite 3 setae; at anterior face of endite located short naked seta and a sensillum (Fig. 38). Endite 1 with two 2-segmented setae, both setulated in distal part, a small geniculated seta shifted to the limb base, and a sensillum on the anterior face of limb. Six rows of thin long setules on ventral face of limb. Two ejector hooks subequal in length. Maxillar process with single short setulated seta (Fig. 38).

Trunk limb II subtriangular (Fig. 39). Exopodite elongated, of irregular shape, with single slender seta three times shorter than exopodite itself (Fig. 40). Eight scraping spines increasing in length distally, with the exception of scrapers 3 and 6, which are shorter than neighbours. Distal armature of gnathobase with four elements. Filter plate II with seven setae, the posteriormost member three times shorter than others, with long setules distally.

Trunk limb III: epipodite oval, without finger-like projection (Fig. 41). Exopodite subquadrangular, with seven setae. Seta 3 being longest, seta 6 about ½ of seta 3, setae 1 and 4 subequal in length, about 1/3 length of seta 3, other setae short. Setae 1–5 plumose, seta 6 with three rows of hard setules in distal part, seta 7 plumose in distal part. Distal endite with 3 setae (Fig. 42), two distalmost members scraping, slender, sharp, with weak denticles in distal part, basalmost seta strongly geniculated and flattened, bilaterally armed with long setules. Two small sensillae located between their bases. Basal endite with 4 plumose setae increasing in size basally. Four pointed soft setae increasing in size basally, a small slender sensillum near the distalmost seta. Gnathobase unclearly separated from basal endite. Distal armature of gnathobase with four elements. The first one is an elongated, narrowing distally sensillum, the second — strongly geniculated seta, third and fourth — spines. Filter plate III with seven setae subequal in size and with similar setulation.

Trunk limb IV: Pre-epipodite setulated; epipodite oval, with short finger-like projection three times shorter than exopodite itself (Fig. 43). Exopodite rounded, with six plumose setae, seta 1 and 3 being longest, equal in length, seta 2 slightly shorter, setae 4–6 subequal in length, about 1/3 length of seta 1. Inner portion of limb IV with four setae and a sensillum (Fig. 44). Scraping seta slender, with small denticles in distal part, three flaming-torch seta decreasing in size basally, with 10–15 long setules each, a small sensillum located near the base of middle flaming-torch seta. Three soft setae slightly increasing in size basally. Gnathobase with one long 2-segmented setae and a small hillock distally. Filter plate with five setae.

Trunk limb V: pre-epipodite setulated; epipodite oval, with finger-like projection two times shorter than epipodite itself (Fig. 45). Exopodite suboval, not divided into two lobes, with four plumose setae, with length evenly decreasing basally, seta 4 four times shorter than seta 1. Inner limb portion as a narrow elongated lobe, with setulated inner margin. At inner face, two setae densely setulated in distal part, one two times shorter than other. Filter plate with a



Figs 18–28. *Alona meridionalis* sp.n. from the Republic of South Africa, Eastern Cape, McClear, rockpool at Prentjiesberg:18–26 — parthenogenetic female: 18 — head shield, 19–20 — head pores, 21–22 — labrum, 23 — ventral margin of valves, 24 — antennule, 25 — antenna, 26 — maxillule; 27— head pores of juvenile female of instar II; 28 — head pores of juvenile male of instar I. Scale bars denote 0.1 mm for 18, 21–23, 25, 0.05 mm for 19–20, 24, 26–28.

Рис. 18–28. *Alona meridionalis* sp.n. из Южноафриканской Республики, Eastern Cape, McClear, rockpool at Prentjiesberg:18–26 — партеногенетическая самка: 18 — головной щит, 19–20 — головные поры, 21–22 — лябрум, 23 — нижний край створок, 24 — антеннула, 25 — антенна, 26 — максиллула; 27 — головные поры ювенильной самки второго возраста; 28 — головные поры ювенильного самца первого возраста. Масштаб 0,1 мм для 18, 21–23, 25, 0,05 мм для 19–20, 24, 26–28.

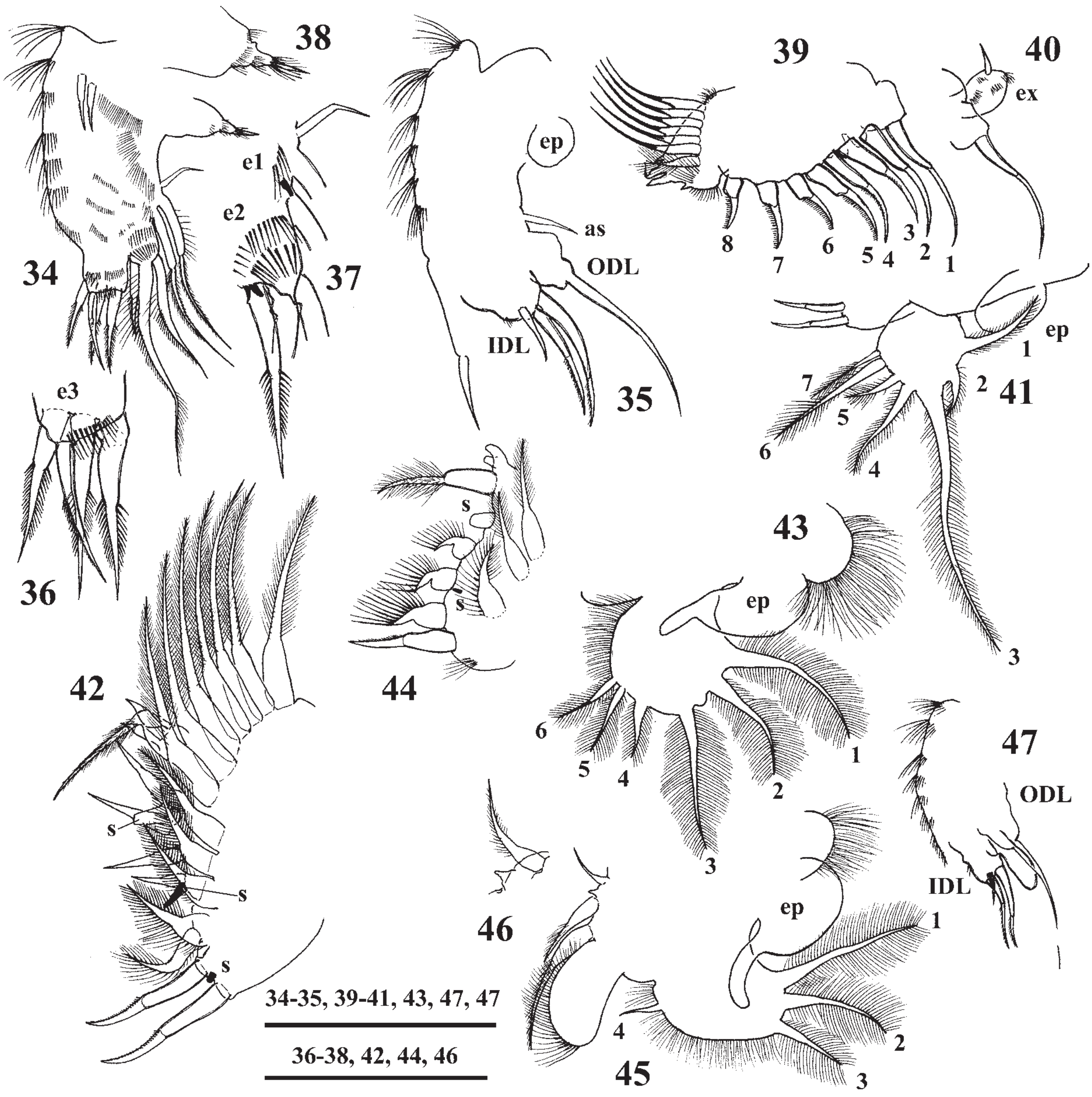
single short seta, a peculiar structure with broad base between inner face setae and filter plate (Fig. 46).

Ephippial female with higher body than parthenogenetic female (Figs 6–7), with almost subrectangular body. Posterodorsal angle of valves well-defined, projecting backward, posterior margin of valves almost straight. Ephippium yellow-brown, with moderately developed egg locules (Fig. 16), with weakly developed hexagonal sculpturing in posteroventral part.

Adult male unknown. A single studied juvenile male of instar I had body similar to that of the juvenile female (Fig. 8). Lateral head pores similar to these of juvenile female (Fig. 28). Postabdomen (Fig. 9) of same shape and armament as in female, ventral margin with the notch in the middle, above the sperm duct openings. Postabdominal claws shorter, stouter and strongly curved than in female, basal spine same as in female. Antennule same as in female, with nine aesthetascs. Trunk limb I (Fig. 47) with anlage of the copulatory hook, IDL same as in female.

Size. In females of the second juvenile instar, length 0.44–0.48 mm, height 0.30–0.34 mm. In adult female, length 0.54–0.71 mm, height 0.37–0.48 mm. Single studied male of the first juvenile instar had length 0.37 mm, height 0.26 mm.

Distribution and ecology. *A. meridionalis* is known only from two small (possibly temporary) rockpools from a single location in the Drakensberg Mountains, East Cape Province of the Republic of South Africa. The pH in the type locality was 7.0, and 8.1 in the other rockpool. The exact altitude of the area is unknown, but is can be approximated as about 1600–1800 m above the sea level. Only one other species of cladocera, the aforemented endemic Chydorinae



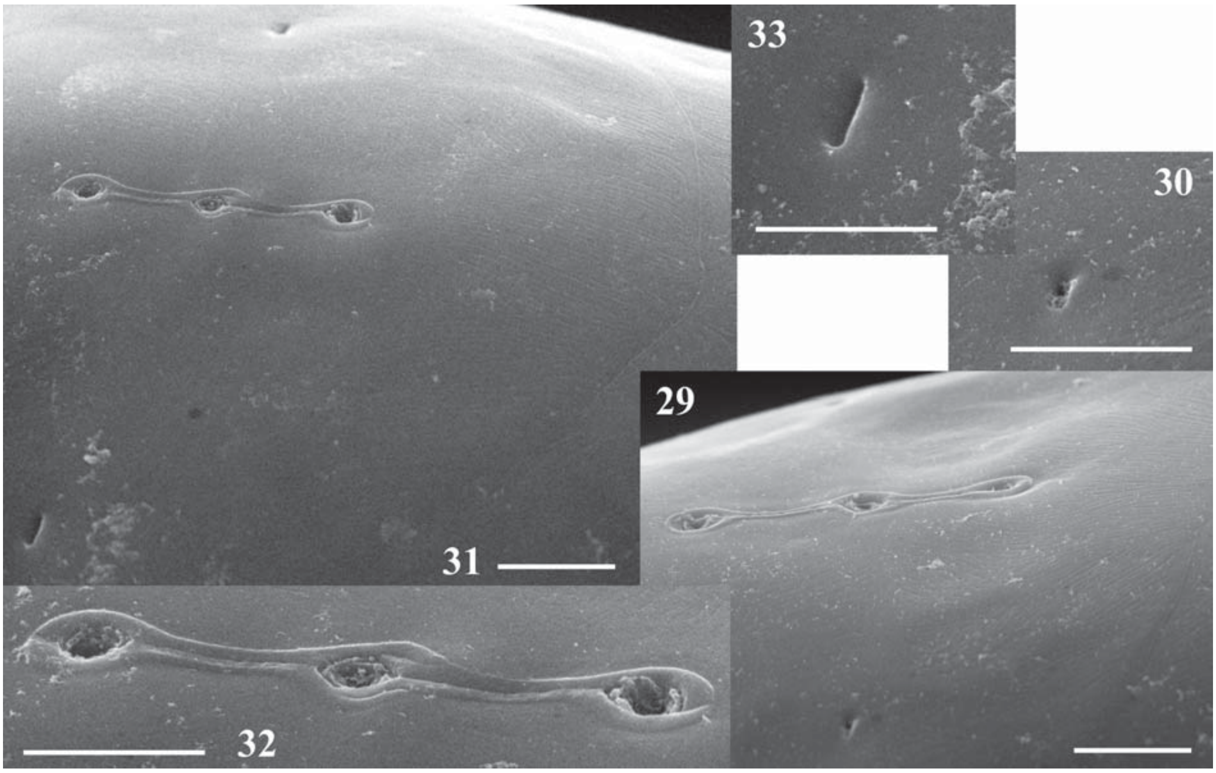
Figs 29–33. *Alona meridionalis* sp.n. from the Republic of South Africa, Eastern Cape, McClear, rockpool at Prentjiesberg: 29–30 — head pores and lateral head pore of juvenile female of instar II; 31–33 — head pores, major head pores and lateral head pore of partenogenetic female. Scale bars denote 0.01 mm.

Рис. 29–33. *Alona meridionalis* sp.n. из Южноафриканской Республики, Eastern Cape, McClear, rockpool at Prentjiesberg: 29–30 — головные поры и латеральная головная пора ювенильной самки второго возраста; 31–33 — головные поры, главные и латеральная головная пора партеногенетической самки. Масштаб 0,01 мм.

Dumontiellus africanus, was found in the type locality, no other Cladocera were found in the other rockpool.

Discussion

At first glance, the gross morphology of *Alona meridionalis* agrees well with the Sars' [1916] descriptions of the two species of *Alona* from the same region, *A. harpularia* and *A. arcuata.* Both of them were never reported again. The remaining material (several slides) on the former species was examined by author during the visits to the Zoological Museum of Oslo University. Unlike *A. meridionalis*, *A. harpularia* has two IDL setae with strong setules in distal part, prominent sculpturing of the carapace, rounded labral keel, and short and thin seta on the basal segment of the endopod of the antenna [personal observations]. This taxon is most probably a synonym of *A. bukobensis*. All material of *A. arcuata* was lost. Comparison of initial descriptions of *A. harpularia* and *A. arcuata* reveals no differences between these two taxa significant from the modern point of view, so, like *A. harpularia*, *A. arcuata* seems



Figs 33–48. *Alona meridionalis* sp.n. from the Republic of South Africa, Eastern Cape, McClear, rockpool at Prentjiesberg: 34–46 — trunk limbs of parthenogenetic female: 34–35 — limb I in inner and outer view, 36–38 —details of limb I — endite 3, endites 1–2, maxillar process, 39–40 —limb II and its exopodite, 41–42 — exopodite and inner portion of limb III, 43–44 — exopodite and inner portion of limb III, 46–47 — limb V and its gnathobase; 48 —limb I of juvenile male of instar I. Scale bars denote 0.1 mm for 34–35, 39–41, 43, 45, 47 and 0.05 mm for 36–38, 42, 44, 46.

Рис. 33–48. *Alona meridionalis* sp.n. из Южноафриканской Республики, Eastern Cape, McClear, rockpool at Prentjiesberg: 34–46 — ноги партеногенетической самки: 34–35 — нога I изнутри и снаружи, 36–38 — детали строения ноги I: эндит 3, эндиты 1–2, максиллярный вырост, 39–40 — нога II и ее экзоподит, 41–42 — экзоподите и внутренняя часть ноги III, 43–44 — экзоподит и внутренняя часть ноги IV, 46–47 — нога V и ее гнатобаза; 48 — нога I ювенильного самца первого возраста. Масштаб 0,1 мм для 34–35, 39–41, 43, 45, 47 и 0,05 мм для 36–38, 42, 44, 46.

to be the synonym of *A. bukobensis*. Anyway, according to the initial description, *A. arcuata* also has prominent sculpturing of the carapace, and eye and ocellus of the same size, so it obviously differs from *A. meridionalis*.

At present, A. *meridionalis* seems to an endemic species of the Drakensberg Mountains. But the chydorid fauna of Africa in general is not yet fully studied [Korovchinsky, 1992], so it is possible that *A. meridionalis* could have a wider distribution.

Analysis of morphology of *A. meridionalis*

The egg-shaped body with the maximum height in the second quarter of the body is relatively rare for the genus *Alona.* Only several species — *A. phreatica* Dumont, 1983, *A. salina* Alonso, 1996, *A. orellanai* Alonso, 1996 [see Alonso, 1996], *A. labrosa* Vasiljeva & Smirnov, 1969 [see Sinev & Kotov, 2000], *A. harpularia* [personal observations], have a similarly shaped body. On the other hand, absence of prominent sculpturing on the carapace is frequently observed within the genus. Posteroventral angle of the valves armed with numerous short setules of equal size is common within the genus, it present in all species of *cambouei* group [see Sinev, 2001a], *A. salina, A. orellanai* and many other species.

The majority of the genus has the head shield of same shape as *A. meridionalis,* the absence of prominent sculpturing on the head shield is also quite common. Three interconnected pores are present in the most species of the genus, less that 25 % of *Alona* species have three disconnected pores, like in *A. cambouei* Guerne & Richard, 1893 and *A. niragica* Margaritora, 1971, or two connected pores, like species of *affinis* and *verrucosa* groups [see Smirnov, 1971; Alonso, 1996]. But the distinctive linear depression at the midline of the interporal connections, present in *A. meridionalis* was never observed in other species of the genus studied under SEM. Transverse slot-shaped lateral pores without pockets below seems to make an unique feature not only for the genus *Alona*, but for the whole subfamily Aloninae; it is an obvious autoapomorphy of A. *meridionalis*. Similarly shaped pores are

present in the species of the *costata*-group of *Alona*, but here they are significantly longer (no less then 0.3 IP) and have distinctive cavities under them, not present in *A. meridionalis*.

The labral keel of *A. meridionalis*, while wedge-shaped, is not so strongly developed as in *A. labrosa*, *A. phreatica* and *A. protzi* Hartwig, 1900, and seems to be more similar to that of the majority of the genus that to these species.

The general shape of postabdomen of *A. meridionalis* cannot be counted as unusual among the greatly varying postabdomens of *Alona*. Similarly shaped postabdomens are observed in *A. salina*, *A. orellanai, A. elegans* Kurz, 1874 [see Alonso, 1996], *A. protzi, A. labrosa* [see Sinev & Kotov, 2000], and in numerous forms of *A.* cf. *rectangula* [Smirnov, 1971]. The clusters of marginal denticles of *A. meridionalis* are unusually small for the genus *Alona*, where most species have moderately or strongly developed denticles [see Alonso, 1996; Smirnov, 1971]. It is quite interesting that similar denticles are present in some of the aforemented species — *A. salina*, *A. orellanai,* and *A. labrosa*.

The morphology of antennule of *A. meridionalis* is quite common for the genus. The only unusual feature in the morphology of antenna in *A. meridionalis* is a long, well-developed seta of the basal segment of endopod. In the majority of species, this seta is much thinner than the other antennal setae, and usually much shorter than the endopod itself. A similar seta of basal segment is present in *A. phreatica, A. salina*, *A. orellanai, A. elegans* [Alonso, 1996].

The morphology of limbs in *A. meridionalis* seem to be "general" for the genus *Alona* — there are no reduced or strongly developed setae or other structures, which can be treated as a result of the specialization. For example, most species of the genus have three IDL setae, with the small slender first IDL setae, most species have seven setae on the exopodite III, and so on. The only unique feature of *A. meridionalis* is a single seta of the filter plate V. In other species of the genus, it is either consists of three setae (*affinis*, *costata,* and *guttata*-groups) or absent (*A. quadrangularis*, *rectangula*, *verrucosa,* and *pulchella*-groups). Unfortunately, there is no reliable information about this structure for many other species.

Position of *A.meridionalis* within the genus

The affiliation of *A. meridionalis* within the genus is not very clear. It obviously does not belong to any of the "core" groups of *Alona*, like *affinis*, *rectangula*, *pulchella,* or *guttata*. Comparison of the *A. meridionalis* morphology with that of the *costata*-group species [Sinev, 1999, 2001b] reveals that the differences between them are numerous, and similarities, other that the shape of head pores, are few. Species of the *costata*-group have well-developed single marginal denticles of the postabdomen, a weakly developed seta on the basal segment of endopod of antenna, three setae in the filter plate V, they posses limb VI, and have numerous peculiarities in the morphology of some limb setae. So *A. meridionalis* and species of *costata*-group are not closely related, and presence of the transverse lateral head pores here is not a synapomomorphy.

At present, *A. meridionalis* appears to be closely related to the pair of the species from the Iberian Peninsula — *A. salina* and *A. orellani*, both described by Alonso [1996]. All these species have the same shape of the body, the similar shape and armament of the postabdomen, a long seta on the basal segment of endopod of antenna, same armament of the posteroventral corner of valves, the similar morphology of antenna, and three major head pores. The structure of lateral pores was not studied under SEM for the Iberian species. Main distinctive characters of the Iberian species — lack of a seta on middle segment of endopod of antenna in *A. salina* and an additional row of the lateral fascicles of setae on the postabdomen in *A. orellani* — are clearly autoapomorphies of these species and do not contradict this hypothesis. Both species differ from *A. meridionalis* by the well-developed sculpturing of head shield and carapace and by the rounded labral keel, but these characters can be quite variable within the group of related species.

Unfortunately, morphology of limbs was not studied for the Iberian species. Affinities of *A. meridionalis* with some other species, like *A. labrosa* and *A. phreatica*, are not so numerous, and balanced by numerous differences.

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